

LABWINDOWS/CVI VERSION 5.0

RELEASE NOTES FOR WINDOWS

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Introduction to LabWindows/CVI

These release notes contain installation instructions, system requirements, new features, and updated information to help you begin using LabWindows/CVI, version 5.0.

LabWindows/CVI Installation for Windows

Before working on your data acquisition and instrument control applications, you must install LabWindows/CVI on your computer. The LabWindows/CVI setup program does this for you in a process that lasts approximately 10 minutes.

Minimum System Requirements for Windows 95/NT

To run LabWindows/CVI for Windows 95/NT, you must have the following:

- Windows 95 or Microsoft Windows NT operating system, version 4.0 or higher
- Personal computer using at least a 33 MHz 486 or higher microprocessor
- VGA resolution (or higher) video adapter
- Minimum of 16 MB of memory
- 50 MB free hard disk space
- Microsoft-compatible mouse



Note *The dialog box the Edit Instrument Attributes command displays requires an 800-by-600 video adapter resolution.*

Minimum System Requirements for Windows 3.1

To run LabWindows/CVI for Windows 3.1, you must have the following:

- MS-DOS, version 3.1 or higher
- Windows operating system, version 3.1 or higher
- Personal computer using at least a 33 MHz 386 or higher microprocessor
- VGA resolution (or higher) video adapter
- Math coprocessor or one of the following coprocessor emulation programs:
 - WEMM387.386 from Watcom
 - Q387 from Quickware
- Minimum of 8 MB of memory
- 30 MB free hard disk space
- Microsoft-compatible mouse



Note *The dialog box the Edit Instrument Attributes command displays requires an 800-by-600 video adapter resolution.*

Installing LabWindows/CVI on a Computer

1. Make sure that your computer and monitor are on and that Windows is installed.
2. If installing from diskette, make back-up copies of your LabWindows/CVI diskettes and store the originals in a safe place.
3. Close all open Windows applications and leave the operating system in Windows.
4. Insert the installation CD into the CD-ROM drive or insert Disk 1 into drive A or drive B and close the drive door, if necessary.
5. For Windows 95 or Windows NT version 4.0 or higher, choose the **Run** option from the desktop taskbar. For Windows 3.1, choose **Run** from the **File** menu in the Program Manager.
6. Type `x:\setup` (where *x* is the drive you are using) in the command line box and click on **OK**.
7. Follow the instructions that appear in the dialog boxes.



Note

When you install LabWindows/CVI for Windows 95/NT, you must choose your compatible compiler. If sometime later you want to change your choice, run the installation program again and select the option that allows you to choose a new compatible compiler. This method is much faster than changing your compiler choice by reinstalling LabWindows/CVI.



Note

You must choose the Custom Installation option to install the complete Windows SDK from the CD-ROM version of the LabWindows/CVI FDS (Full Development System). Some Windows SDK header and import library files are installed with the disk version and the CD-ROM version for the LabWindows/CVI Base Package. The Windows SDK help file is available only with the CD-ROM version of the LabWindows/CVI FDS.

National Instruments suggests you install the complete LabWindows/CVI program to take full advantage of all the LabWindows/CVI capabilities. If you choose to install with options, select the options you want and follow the directions on the screen. You can run the setup program again and install additional files, if necessary.

Refer to the `readme.cvi` file for installation instructions, programming considerations, and changes that are too recent to be included in the printed LabWindows/CVI documentation.

Installing the Run-Time Engine on a Computer

The Run-time Engine is installed during the LabWindows/CVI installation.

LabWindows/CVI includes a separate Run-time Engine distribution disk, or a directory on the CD-ROM, that has its own installation program so you can make copies for distribution as your license agreement permits.

To install the Run-time Engine from the Run-time Engine distribution disk, follow the directions in the [Installing LabWindows/CVI on a Computer](#) section earlier in this document. Refer to Chapter 7, *Creating and Distributing Standalone Executables and DLLs*, of the



Note

The LabWindows/CVI 5.0 Run-time Engine for Windows 95/NT overwrites previous versions of the Run-time Engine. Thus, LabWindows/CVI 4.x-generated executables and DLLs use the new LabWindows/CVI 5.0 Run-time Engine. In addition, the LabWindows/CVI 4.x Create Distribution Kit feature includes the LabWindows/CVI 5.0 Run-time Engine instead of the LabWindows/CVI 4.x Run-time Engine in generated distribution kits.

Installing the VISA Library

You need the VISA Library to use the new instrument driver standard the VXIplug&play Systems Alliance accepts. VISA stands for Virtual Instrument Software Architecture. NI-VISA is installed as part of the LabWindows/CVI disk and CD-ROM installations for Windows 95/NT. NI-VISA must be installed separately for LabWindows/CVI for Windows 3.x.

Installing the IVI Engine

You need the IVI Engine to use IVI (Intelligent Virtual Instruments) drivers on a system. The IVI Engine is installed as part of LabWindows/CVI for Windows 95/NT and Windows 3.x. LabWindows/CVI for Windows 95/NT includes a separate set of IVI Engine distribution disks or a directory on the CD-ROM that has its own installation program so you can make copies for distribution with your application. On Windows 3.x, the IVI Engine is a static library that is linked into your application.

What's New and Different in LabWindows/CVI 5.0

This section includes information about changes and enhancements in LabWindows/CVI 5.0 that have been made since LabWindows/CVI 4.0.1.

New Features

- IVI (Intelligent Virtual Instruments) driver wizard and support library
- ActiveX Automation Server instrument driver wizard and support library
- DLL debugging in the LabWindows/CVI development environment
- Multithread-safe libraries on Windows 95/NT; refer to the discussion of each library for any restrictions
- Direct printing replaces bitmap printing on all Windows platforms
- Ability to scale panels and contents to different screen resolutions and when you resize the panels
- New Advanced Analysis functions for Vector & Matrix Algebra

Changes to System Requirements

If you want to run LabWindows/CVI 5.0 on Windows NT, you must have Windows NT 4.0 or higher. LabWindows/CVI 5.0 does *not* run on Windows NT 3.51.



Note *Version 5.0 is the final release of LabWindows/CVI for Windows 3.1.*

Toolslib Instrument Drivers

Table 1 lists new instrument drivers.

Table 1. New Toolslib Instrument Drivers

Filename	Description
toolslib\	
custctrl\cviogl.fp	3D OpenGL plotting control
toolbox\asynctmr.fp	Asynchronous timer control

Multithreading Limitations on Toolslib Instruments

The following instruments under the `\toolslib\` subdirectory are not multithread safe:

- `custctrl\animate.fp`
- `custctrl\daqchart.fp`
- `custctrl\easytab.fp`
- `custctrl\movectrl.fp`
- `custctrl\pwctrl.fp`
- `custctrl\scroll.fp`
- `custctrl\toolbar.fp`
- `toolbox\regexpr.fp`
- `toolbox\toolbox.fp`

New Sample Programs

Table 2 lists new samples.

Table 2. New Sample Projects

Filename	Description
samples\activex\	
cvi\cvidemo.prj	ActiveX Automation of LabWindows/CVI 5.0 to build and run projects
excel\exceldem.prj	ActiveX Automation of Microsoft Excel 97

Table 2. New Sample Projects (Continued)

Filename	Description
hiq\report.prj	ActiveX Automation of HiQ 3.1/4.0 to generate a report
hiq\xferdt.prj	ActiveX Automation of HiQ 3.1/4.0 to transfer data
ie\iedemo.prj	ActiveX Automation of Microsoft Internet Explorer 4.0
labview\lvdemo.prj	ActiveX Automation of LabVIEW 5.0 to run VIs
word\worddemo.prj	ActiveX Automation of Microsoft Word 97
samples\analysis\	
2dfft.prj	Demonstrates using FFT to do a 2D FFT
nlinfit.prj	NonLinearFit using the Levenberg-Marquardt method
parsevls.prj	Demonstrates Parseval's theorem
polyfit1.prj	Demonstrates data conditioning for PolyFit
transmit.prj	Simulates a transmission and receiver system
thd.prj	Total Harmonic Distortion
stat.prj	Simple statistics example
stability.prj	Evaluates the stability of the system
samples\custctrl\cvio-gl	
ogldemo.prj	3D graph plotting using CVIOGL instrument driver
ogldraw.prj	Uses CVIOGL instrument driver for OpenGL rendering
simple.prj	3D graph plotting using CVIOGL instrument driver
samples\dlldebug	
scope.prj and usescope.prj	Demonstrates creating and debugging a DLL
samples\toolbox	
asyncdem.prj	Asynchronous timer example

Table 2. New Sample Projects (Continued)

Filename	Description
samples\sdk\	
studio\demo.prj	Uses SDK to change Standard Input/Output window appearance
taskbar\taskbar.prj	Creates icon on system taskbar
printlst\printlst.prj	Queries system for available printers
glaux\glauxdem.prj	Demonstrates using OpenGL Glaux library for 3D rendering
samples\sdk\threads\	
multipnl\multipnl.prj	Demonstrates using UIR panels in multiple threads
onepanel\onepanel.prj	Demonstrates using non-UIR threads
samples\userint\	
scaling.prj	Demonstrates UIR panel scaling

Changes to the LabWindows/CVI Development Environment

This section contains information on several enhancements to the LabWindows/CVI development environment.

Debugging DLLs in Windows 95/NT

You can now debug DLLs in the LabWindows/CVI development environment. Refer to the *DLL Debugging (Windows 95/NT Only)* section in Chapter 3, *Project Window*, of the *LabWindows/CVI User Manual* for more information on different ways to debug DLLs, location of files required for debugging DLLs, and what restrictions apply.

DLL Debugging Menu Item (Windows 95/NT Only)

This command applies only when you set the **Target** item in the **Build** menu to **Dynamic Link Library**. If the **DLL Debugging** command is enabled when you create a DLL, LabWindows/CVI includes debuggable code in your DLL and generates an extra file that contains a symbol table and source position information necessary for debugging. The extra file has the same pathname as the DLL except that its extension is `.cdd`.

In the LabWindows/CVI development environment, you can debug only DLLs you create in LabWindows/CVI with the **DLL Debugging** command enabled. Other development environments cannot debug DLLs you create in LabWindows/CVI.


When you debug a DLL in LabWindows/CVI, you can use all the standard debugging features, but the run-time checking features are not available. Thus, you can use single-stepping, conditional breakpoints, watch expressions, and the Variables window, but there is no interactive reporting of library errors and no protection against overwriting arrays or misuse of pointers. When you create a DLL with the **DLL Debugging** command disabled, LabWindows/CVI forces the debugging level to None. When you create a DLL with the **DLL Debugging** command enabled, LabWindows/CVI forces the debugging level to No Run-Time checking. You can access the debugging level from the **Run Options** command in the **Options** menu of the Project window.


Select External Process

This command applies only when you set the **Target** item in the **Run** menu to **Dynamic Link Library**. The **Select External Process** command allows you to specify a standalone executable that uses your DLL. When you execute the command, a dialog box appears in which you enter the pathname and command line arguments to an external program. The **Run Project** item in the **Run** menu then changes to **Run xxx.exe**, where `xxx.exe` is the filename of the external program. When you execute the **Run xxx.exe** command, LabWindows/CVI starts the external process and attaches to it for debugging. If you have set any breakpoints in the source files for the DLL, LabWindows/CVI honors them.



LabWindows/CVI stores external program pathname and command line arguments in the project.


Automatic Generation of Object Files

The new  icon in the Project window applies only to source (`.c`) files and indicates that you enabled the Compile into Object option. If this option is enabled when you compile the source file, LabWindows/CVI creates an object (`.obj` or `.o`) file on disk that contains non-debuggable code rather than generating debuggable code in memory. Double click on this icon to toggle the option.

When you open a project, LabWindows/CVI marks each source file with the  icon for compilation only if one of the following conditions applies:

- The object file does not exist on disk.
- The source file or any of the include files on which it depends has a date later than the date of the object file.

As you work, LabWindows/CVI marks source files for recompilation whenever they or any of their include files are modified, regardless of the state of the  icon. When you select the **Build Project** or **Run Project** command, LabWindows/CVI compiles all source files marked for recompilation. For source files with the  icon, LabWindows/CVI also generates the corresponding object files.

This feature is useful if you do not want to recompile all your source files each time you load your project. Debugging is not available for files with the  icon, so this feature also is useful when you want to suppress debugging on a source file.

Create Dynamic Link Library Dialog Box

The ring control Where to Copy DLL allows you to instruct LabWindows/CVI to copy the DLL to a different directory after you create it. Your choices are the following:

- Do not copy
- Windows System directory
- *VXIplug&play* directory (the *bin* directory under the *VXIplug&play* framework directory)

If you choose to include a type library when you create a DLL, LabWindows/CVI now saves the GUID for the type library in the project. Previous versions of LabWindows/CVI do not generate a new GUID each time you build the DLL. If you also choose the Include File Symbols for the exports option, LabWindows/CVI now adds to the type library the integer and floating-point constants and enums from the header file you specify for the exports.

Breakpoints/Tags in Non-Project Files Are Saved in Project

Previous versions of LabWindows/CVI do not save breakpoints or tags you set in files that are not in the project. Also, when you unload the project, breakpoints and tags in non-project files remain in effect.

To accommodate DLL debugging, LabWindows/CVI 5.0 now saves all breakpoints and tags in the project, regardless of whether the files to which they apply are in the project. When you unload the project, LabWindows/CVI removes all breakpoints and tags from any non-project files you might have open. However, LabWindows/CVI does not save breakpoints and tags in the Interactive Execution window in the project and does not remove them when you unload a project.

New Control in Watch Expression Dialog Box

Project/DLL is a new control in the Add/Edit Watch Expression dialog box. You use this control when you debug a DLL but do not have the project for the DLL open. The control indicates whether the watch expression applies to the current project or to a separate DLL. The default value for the control is Current Project.

If you want the watch expression to apply to a DLL that is not the target of the current project, you must supply the name of the DLL. A menu ring to the right of the control contains the current project value and the names of all currently loaded DLLs.

Activate Panels When Resuming: Clarification

When you enable the **Activate Panels When Resuming** option in the **Run** menu of the Source window, LabWindows/CVI activates your most recently active panel upon resuming

execution *only* if it was the active window at the time execution was suspended. If a LabWindows/CVI window, such as a Source window, was active at the time execution was suspended, LabWindows/CVI does not reactivate a window.

For instance, if you suspend execution by selecting the **Break Execution** option from the **Run** menu in a Source window, LabWindows/CVI does not reactivate a window when you resume execution.

New Print Dialog Box

For more information on printing graphics and text on Windows using the reorganized Print dialog box, refer to the [Revised Print Dialog Boxes on Windows](#) section in the [Changes to the User Interface Library](#) section later in this document.

New Options for Source File Printing

New options for printing source files include adding the date, time, and filename at the top of each page, adding page numbering, and choosing various text style options. The text style options apply to Windows platforms only. The new options on the dialog box correspond to the new text printing attributes in the User Interface Library. Refer to the [Application of Attributes to Text Printing](#) and [New Print Attributes](#) sections in the [Changes to the User Interface Library](#) section later in this document.

Edit Menu

The **Find** and **Replace** commands of the **Edit** menu of the Function Tree Editor window and the Function Panel Editor window open dialog boxes similar to the Find and Replace dialog boxes in the Source window, which allow you to search and replace text in the entire function panel (.fpx).

Code Menu

In certain cases, the **Select Attribute Constant** command in the **Code** menu replaces the **Select UIR Constant** command. This occurs in panels for functions that set or get attribute values. The User Interface Library, the VISA Library, and IVI drivers include such functions, for example, `GetCtrlAttribute`, `SetCtrlAttribute`, `GetPanelAttribute`, and `SetPanelAttribute` in the User Interface Library. The panels for these functions each contain an Attribute ring control and a corresponding Value input control. When you use either of these two controls, the **Select Attribute Constant** command appears in the **Code** menu. The action of the command differs based on whether you use the Attribute or Value control.

New Tools Menu

This section describes the commands in the **Tools** menu of the Project, Source, Function Panel, Function Tree Editor, and Function Panel Editor windows.

Create ActiveX Automation Controller (Windows 95/NT only)

Use the **Create ActiveX Automation Controller** command to generate a new instrument driver for an ActiveX Automation Server. When you select the **Create ActiveX Automation Controller** command, the Select ActiveX Automation Server dialog box appears, which contains a list of the ActiveX Automation Servers on the current computer. After you select an ActiveX Automation Server, a wizard guides you through creating an instrument driver to control the ActiveX Automation Server. The wizard lets you select the property constants, method functions, and creation functions for the objects to include in the instrument driver. Refer to the *Create ActiveX Automation Controller (Windows 95/NT Only)* section in Chapter 3, *Project Window*, of the *LabWindows/CVI User Manual* for more information on how to use this feature.

Update ActiveX Automation Controller (Windows 95/NT only)

Use the **Update ActiveX Automation Controller** command to add new objects to an existing ActiveX Automation controller instrument driver. The command opens the Browse ActiveX Automation Server dialog box for the ActiveX Automation Server the instrument driver controls. Refer to the *Create ActiveX Automation Controller (Windows 95/NT Only)* section in Chapter 3, *Project Window*, of the *LabWindows/CVI User Manual* for more information on how to use this feature.

Create IVI (Intelligent Virtual Instruments) Instrument Driver

Use the **Create IVI Instrument Driver** command and the IVI wizard to create the source file, include file, and function panel file for controlling an instrument. You can base the new instrument driver on one of the following:

- An existing driver for a similar instrument
- The core IVI driver template
- A template for a particular type of instrument

The IVI wizard copies the template or existing driver files and replaces all instances of the original instrument prefix with the prefix you select for your new driver.

Refer to the *LabWindows/CVI Instrument Driver Developers Guide* for more information on IVI drivers.

Edit Instrument Attributes

Use the **Edit Instrument Attributes** command to add, delete, or edit attributes for an IVI driver. You can invoke this command only if the file in the Source window has the same path and base filename as an instrument driver function panel (.fpx) file and its associated .sub file. The command is useful only if the instrument driver files were generated using the **Create IVI Instrument Driver** command.

This command analyzes the instrument driver files to find all the attributes the driver uses. It then opens a dialog box that displays the attributes and information about them. In the dialog

box, you can add or delete attributes, modify their properties, and enter help text for them. When you apply the changes, the command modifies the source, include, and function panel files for the instrument driver.

If you use this command when the text cursor is over the defined constant name or callback function name for one of the attributes, the dialog box appears with that attribute selected in the list box.

Refer to the *LabWindows/CVI Instrument Driver Developers Guide* for more information on IVI drivers.

Edit Function Tree

Use the **Edit Function Tree** command to display the Function Tree window for the function panel (.fcp) file associated with the file in the Source window. The function panel file must have the same path and base filename as the file in the Source window.

Edit Function Panel

Use the **Edit Function Panel** command to display the Function Panel Editor window for a function defined in an instrument driver source file. You can use this command only if the file in the Source window has the same path and base filename as an instrument driver function panel (.fcp) file. The text cursor must be over the name of a function that has a function panel in the .fcp file.

Generate Source for Instrument Driver Functions

LabWindows/CVI 5.0 includes two new menu items for generating source for instrument driver functions: **Generate Source for Function Panel** in the Function Panel Editor window and **Generate New Source for Function Tree** in the Function Tree Editor window.

Go To Definition

Use the **Go To Definition** command to display the function in the source (.c) file associated with the specified function in the Function Panel Editor window. The function panel file must have the same path and base filename as the file in the Source window.

Go To Declaration

Use the **Go To Declaration** command to display the function prototype in the header (.h) file associated with the specified function in the Function Panel Editor window. The function panel file must have the same path and base filename as the file in the Source window.

Enable Auto Replace

Use the **Enable Auto Replace** command to enable automatic updating of all definitions and declarations for function names when LabWindows/CVI updates the instrument prefix or the function name in the Function Tree Editor window or Function Panel Editor window.

Generate IVI C++ Wrapper

Use the **Generate IVI C++ Wrapper** command to generate a C++ wrapper for an IVI driver. Refer to the *LabWindows/CVI Instrument Driver Developers Guide* for more information on IVI drivers.

Context Menus

You can access a context menu in the Function Tree Editor window by pressing the right mouse button. The context menu contains a selection of the most commonly used menu commands from the Function Tree Editor window menubar. The Function Tree Editor window now includes the following context menu items:

- Edit Node
- Edit Function Panel Window
- Edit Help
- Generate Source For Function Node
- Go To Declaration
- Go To Definition

The Source window now includes the following new context menu items:

- Edit Function Tree
- Edit Function Panel
- Edit Instrument Attributes

User-Defined Entries in Tools Menu

You can install your own entries in the **Tools** menu. Each entry invokes an executable with optional command line arguments. Use the **Tools Menu Options** command from the **Options** menu of the Project window to add your own entries to the **Tools** menu.

Tools Menu Options

The new **Tools Menu Options** command in the **Options** menu of the Project window allows you to add your own menu items to the **Tools** menu that appears in the Project, Source, Function Panel, Function Tree Editor, and Function Panel Editor windows. Each entry consists of a menu item name and an associated command line to execute. Each command line consists of a program name and optional arguments. When you execute an item from the **Tools** menu, LabWindows/CVI calls a system function to start another process, passing the command line as a parameter.

New Configuration Option

The DST rules string allows you to specify the periods of the year in which daylight savings time is in effect. The time and date functions in the LabWindows/CVI ANSI C Library use

this information. In previous versions of LabWindows/CVI, you can specify the daylight savings time period only by modifying the `cvimsgs.txt` file in the `cvl\bin` directory.

For information on the format of the DST rules string and how the time and date functions use it, refer to the *Time and Date Functions* section in Chapter 1, *ANSI C Library*, of the *LabWindows/CVI Standard Libraries Reference Manual*.

For instructions on setting the configuration options, refer to the *How to Set the Configuration Options* section in Chapter 1, *Configuring LabWindows/CVI*, of the *LabWindows/CVI User Manual*.

Mouse Wheel Support

The LabWindows/CVI environment windows now support mouse pointing devices with wheels, such as the Microsoft IntelliPoint Mouse. The mouse wheel allows you to scroll up or down in any window, listbox control, or textbox control that contains a vertical scrollbar.

Changes to the User Interface Library

This section contains information on the various changes in the User Interface Library, including the following:

- Direct printing replaces bitmap printing on all Windows platforms.
- The print dialog boxes change on all Windows platforms.
- You can now use the Window system settings for some print attributes.
- Two new attributes keep track of the current printer.
- Six attributes that previously applied only to graphics printing now also apply to text printing.
- Thirteen new attributes apply to printing text files and buffers.
- A new attribute allows scaling of panels to different screen resolutions.
- New attributes allow the scaling of panel contents when you resize the panels.
- Nine new functions exist.
- Five new error codes exist.
- The User Interface Library is now multithread safe when used in standalone executables.



Note

Be sure to read the [Warning of Modified Behavior](#) and [Warning of Change to Text Format \(.tui\) Files](#) sections later in this document.

Change to Default Value of SetSleepPolicy

Starting with LabWindows/CVI 5.0, the default value for `SetSleepPolicy` is `VAL_SLEEP_MORE`. In earlier versions of LabWindows/CVI, the default sleep policy is `VAL_SLEEP_NONE`. `SetSleepPolicy` sets the degree to which your program “sleeps” when

checking for events. Use this function if you require LabWindows/CVI to use more CPU resources so that other applications are given less processor time.

Clarifications and Corrections

The previous version of the manual incorrectly states that values for `ATTR_XOFFSET` and `ATTR_YOFFSET` are expressed in inches. In fact, they are expressed in tenths of millimeters.

`SetSystemPopupsAttribute` and `GetSystemPopupsAttribute` do *not* apply to Windows dialog boxes the User Interface Library uses. For example, you cannot use `SetSystemPopupAttribute` to make the Windows file select dialog box movable.

The top-level panel callback receives the `EVENT_CLOSE` message when the user executes the **Close** command from the **System** menu or clicks on the **X** button at the right end of the panel titlebar.

The main callback receives the `EVENT_END_TASK` message when the user tries to shut down Windows or when the user tries to terminate your application, for example, by executing the **Close** command from taskbar button of the main thread.

When using the new function `SetBitmapData` on a bitmap that already has a mask, you can either supply the same mask array, supply a new mask array, or pass `REMOVE_TRANSPARENCY_MASK` to remove the mask. When you use `REMOVE_TRANSPARENCY_MASK`, the color of the pixels that were transparent under the old mask are *unpredictable*. You can set the value of these pixels in the **bits** parameter.

The following text is incorrect in the *Using Callback Functions to Respond to User Interface Events* section of Chapter 3, *Programming with the User Interface Library*, in the *LabWindows/CVI User Interface Reference Manual*: “A panel callback receives the `EVENT_SIZE` and `EVENT_MOVE` messages when the user resizes or moves the panel. The panel callback does not receive these messages when you programmatically resize or move a panel.”

LabWindows/CVI posts the events `EVENT_PANEL_MOVE` and `EVENT_PANEL_SIZE` when you programmatically move or resize a panel. The panel callback receives the events when the application processes events.

The manual incorrectly defines the return value description for `InsertSeparator`. The returned integer parameter is defined as follows:

menuItemID Returns the ID that LabWindows/CVI uses to specify this menu item in subsequent function calls. Negative values indicate that an error occurred. Refer to Appendix A for error codes.

Direct Windows Printing

On all Windows platforms, the User Interface Library now uses direct Windows printing by default. Previously, the library used only bitmap printing. The new print attribute `ATTR_BITMAP_PRINTING` specifies whether to use bitmap printing or direct printing.

By using direct Windows printing, you can take full advantage of the higher resolution printers have over computer screens. This allows panels and controls to be scaled optimally to the printer coordinates, thus eliminating the aliasing that causes blocky text and graph plots. On the other hand, certain printers do not support the raster operations necessary for printing certain kinds of objects. Specifically, many printers are not capable of printing transparent bitmaps.

Revised Print Dialog Boxes on Windows

For programmatic printing and printing from the **File** menu, a common, unified print dialog box allows you to do the following:

- Select a printer.
- Specify printing options that are specific to LabWindows/CVI. Different sets of options appear for graphics printing as opposed to text printing.
- Open the standard Windows dialog box for the selected printer. You set options that are specific to the printer in this dialog box.

You can programmatically set all the options that are specific to LabWindows/CVI by using `SetPrintAttribute` in LabWindows/CVI. In addition, you can programmatically set some of the attributes in the printer-specific dialog box using `SetPrintAttribute`.

Interaction between Print Dialog Boxes and Programmatic Attributes

LabWindows/CVI 5.0 modifies the way the print dialog boxes interact with attributes when used in a program.

Previously, if you selected a different printer in the dialog box, the User Interface Library did not retain the name of the selected printer. Every time the print dialog box appeared, the printer selection was reset to the current system printer. Now, the library stores the name of the printer you select in a new attribute, `ATTR_PRINTER_NAME`. Whenever the print dialog box appears, LabWindows/CVI sets the printer selection to the current value of `ATTR_PRINTER_NAME`. If `ATTR_PRINTER_NAME` is `NULL`, the empty string, or the name of a printer that is not currently known by Windows, the next call to a printing function uses the current system printer and stores its name as the `ATTR_PRINTER_NAME` value.

Normally, when the user invokes the common print dialog box or the printer-specific dialog box, LabWindows/CVI initializes the controls that correspond to programmatic attributes to

the current attribute values. The new value `VAL_USE_PRINTER_SETTING` allows you to initialize the printer-specific dialog box to the current system values for the printer rather than the current values of the User Interface Library attributes. You can access the system values for the printer in the Control Panel. When the user clicks on **OK** in the dialog box, LabWindows/CVI copies the current values in the controls to the attributes. LabWindows/CVI does not retain the `VAL_USE_PRINTER_SETTING` value.

Refer to the following [Using Windows System Printer Settings](#) section for more information on `VAL_USE_PRINTER_SETTING`.

Using Windows System Printer Settings

`VAL_USE_PRINTER_SETTING` applies to all print attributes for which corresponding Windows system settings exist. You can view and modify the Windows system settings for a printer in the Control Panel. The `VAL_USE_PRINTER_SETTING` value allows you to use the current settings of the operating system instead of the current values of the User Interface Library attributes.

If you call one of the printing functions `PrintCtrl`, `PrintPanel`, `PrintTextBuffer`, or `PrintTextFile` and an attribute value is `VAL_USE_PRINTER_SETTING`, LabWindows/CVI changes the attribute value to the current system setting. The exact behavior depends on whether you instruct the printing function to invoke the print dialog box. Notice that only `PrintCtrl` and `PrintPanel` give you the option to open the dialog box:

- If the function invokes the common print dialog box and the user invokes the printer-specific dialog box, LabWindows/CVI initializes the control that corresponds to the attribute to the current system setting. The user can modify the value. When the user clicks on **OK** in the printer-specific dialog box, LabWindows/CVI stores the current value of the control as the attribute value.
- If the function invokes the common print dialog box but the user never invokes the printer-specific dialog box, LabWindows/CVI stores the system setting as the attribute value when the user clicks on **OK** in the common dialog box.
- If you suppress the dialog boxes, the print function uses the current system setting and stores it as the attribute value.

Notice that LabWindows/CVI does not retain `VAL_USE_PRINTER_SETTING` as the attribute value after you call a printing function. If, throughout the life of your program, you want to use the system settings that are in effect the first time you call a printing function, set the attributes to `VAL_USE_PRINTER_SETTING` at the beginning of your program and do not modify them programmatically thereafter. If, on the other hand, you always want to use the most recent system settings, you must set the attributes to `VAL_USE_PRINTER_SETTING` before each call to a printing function.

You can use `VAL_USE_PRINTER_SETTING` with the following attributes:

- `ATTR_DUPLEX`
- `ATTR_NUMCOPIES`
- `ATTR_ORIENTATION`
- `ATTR_XRESOLUTION`
- `ATTR_YRESOLUTION`



Note

The User Interface Library never changes the current system printer or the current system settings for a printer.

Obsolete Value for X and Y Resolution

For the `ATTR_PRINT_XRESOLUTION` and `ATTR_PRINT_YRESOLUTION` attributes, `VAL_USE_PRINTER_SETTING` replaces `VAL_USE_PRINTER_DEFAULT`, which is obsolete. The actual value, `-1`, remains the same.

In previous versions of LabWindows/CVI, the `VAL_USE_PRINTER_DEFAULT` value does not have the same behavior that `VAL_USE_PRINTER_SETTINGS` does now. If you set an attribute to `VAL_USE_PRINTER_DEFAULT`, the attribute retains that value. This has two consequences. First, you cannot use `GetPrintAttribute` to find out the actual value that was used. Second, LabWindows/CVI uses the most recent printer setting each time you call a print function, even if you set the attribute to `VAL_USE_PRINTER_DEFAULT` only once.

Now that `VAL_USE_PRINTER_SETTING` causes LabWindows/CVI to save the current system setting as the attribute value, there is no reason to overwrite that value with the current system setting on the next print function call. If the user changes the setting in the printer-specific dialog box, most likely, you should use the modified value in subsequent print calls.

Warning of Modified Behavior

When the Run-time Engine for LabWindows/CVI 5.0 is installed, it overwrites previous versions of the Run-time Engine. Thus, executables on a computer with the new Run-time Engine use the new print dialog box.

In addition, any executable that used `VAL_USE_PRINTER_DEFAULT` for `ATTR_PRINT_XRESOLUTION` or `ATTR_PRINT_YRESOLUTION` has the modified behavior of `VAL_USE_PRINTER_SETTING`, as described in the [Using Windows System Printer Settings](#) section earlier in this document.

Revised Constant Names

The constant names for several attributes and values have changed, but the actual values remain the same. The obsolete constant names remain in the `userint.h` include file, so you do not have to change your source code.

The changes to attribute constant names are as follows:

- `ATTR_PRINT_AREA_HEIGHT` replaces `ATTR_PAPER_HEIGHT`.
- `ATTR_PRINT_AREA_WIDTH` replaces `ATTR_PAPER_WIDTH`.
- For `ATTR_PRINT_AREA_HEIGHT` and `ATTR_PRINT_AREA_WIDTH`, `VAL_USE_ENTIRE_PAPER` replaces `VAL_USE_PRINTER_DEFAULT`.
- For `ATTR_XOFFSET` and `ATTR_YOFFSET`, `VAL_CENTER_ON_PAPER` replaces `VAL_USE_PRINTER_DEFAULT`.
- For `ATTR_XRESOLUTION` and `ATTR_YRESOLUTION`, `VAL_USE_PRINTER_SETTING` replaces `VAL_USE_PRINTER_DEFAULT`.

Refer to the *Using Windows System Printer Settings* and *Warning of Modified Behavior* sections earlier in this document for more information.

Application of Attributes to Text Printing

The following existing attributes now apply to text printing and to graphics printing:

- ATTR_DUPLEX
- ATTR_EJECT_AFTER
- ATTR_NUMCOPIES
- ATTR_ORIENTATION
- ATTR_XRESOLUTION
- ATTR_YRESOLUTION

New Print Attributes

The following new print attributes apply to text and graphics printing:

ATTR_PRINTER_NAME	Currently selected printer
ATTR_PRINTER_NAME_LENGTH	Number of characters in currently selected printer
ATTR_SYSTEM_PRINT_DIALOG_ONLY	Specifies to display only the Windows printer-specific dialog box; do not show the LabWindows/CVI print dialog box

The following new print attributes apply only to printing text files and buffers:

ATTR_PRINT_BOLD	Text is bold
ATTR_PRINT_FONT_NAME	Name of current font
ATTR_PRINT_FONT_NAME_LENGTH	Number of characters in current font value
ATTR_PRINT_ITALIC	Text is in italics
ATTR_PRINT_POINT_SIZE	Point size of text
ATTR_PRINT_STRIKEOUT	Text has strikeout
ATTR_PRINT_UNDERLINE	Text is underlined
ATTR_SHOW_DATE	Display current date on first line of each page
ATTR_SHOW_FILE_NAME	Display filename on first line of each page
ATTR_SHOW_LINE_NUMBERS	Display line numbers
ATTR_SHOW_PAGE_NUMBERS	Display page numbers
ATTR_SHOW_TIME	Display current time on first line of each page
ATTR_TAB_INTERVAL	Number of spaces represented by a <Tab> character

New Panel Attributes

LabWindows/CVI 5.0 adds the following panel attributes:

ATTR_SCALE_CONTENTS_ON_RESIZE	LabWindows/CVI scales panel contents when panel is resized
ATTR_MIN_HEIGHT_FOR_SCALING	Smallest panel height for which LabWindows/CVI allows scaling
ATTR_MIN_WIDTH_FOR_SCALING	Smallest panel width for which LabWindows/CVI allows scaling
ATTR_RESOLUTION_ADJUSTMENT	Panel scaled when displayed on different screen resolutions (read-only)
ATTR_HAS_TASKBAR_BUTTON	Panel has its own taskbar button



Note *When you use ATTR_SCALE_CONTENTS_ON_RESIZE and ATTR_RESOLUTION_ADJUSTMENT to scale panels and controls, use TrueType fonts for optimal results.*

New Control Attributes

LabWindows/CVI 5.0 adds the following control attributes:

ATTR_AUTO_SIZING	Specifies whether LabWindows/CVI resizes command button when text is changed; valid values: VAL_ALWAYS_AUTO_SIZE VAL_GROW_ONLY VAL_NEVER_AUTO_SIZE VAL_SHRINK_ONLY
ATTR_PLOT_AREA_LEFT	Offset in pixels of the left edge of the plot area from the left edge of the graph control
ATTR_PLOT_AREA_TOP	Offset in pixels of the top of the plot area from the top of the graph control
ATTR_PLOT_THICKNESS	Thickness of the plot line, in pixels; applies only when ATTR_LINE_STYLE is VAL_SOLID; if ATTR_PLOT_STYLE is ATTR_FAT_LINE or ATTR_FAT_STEP, LabWindows/CVI draws the plot with three times the thickness specified in this attribute

New System Attribute

The ATTR_RESOLUTION_ADJUSTMENT system attribute specifies to what extent LabWindows/CVI scales panels and their contents when displayed on screens with different resolutions.

Resolution Adjustment

When a panel is displayed on a screen with a different resolution than the screen on which you edited the panel, the panel might appear too large or too small. The Edit Panel dialog box in the User Interface Editor contains an option to scale the panel to the resolution of the screen. You can choose to make no adjustment or an adjustment of up to 100 percent. LabWindows/CVI saves your value for this option for each panel in the `.uir` file. LabWindows/CVI scales the panel and its contents when you call `LoadPanel` or `LoadPanelEx` in your program.

You can use the `ATTR_RESOLUTION_ADJUSTMENT` system attribute to override the settings in the `.uir` file. To override the setting for a panel, call `SetSystemAttribute` to set the `ATTR_RESOLUTION_ADJUSTMENT` attribute before you call `LoadPanel` or `LoadPanelEx`. After calling `LoadPanel` or `LoadPanelEx`, you can call `GetPanelAttribute` with `ATTR_RESOLUTION_ADJUSTMENT` to obtain the setting that LabWindows/CVI saved in the `.uir` file.

User Interface Editor Changes

Changes in the User Interface Editor accommodate the new panel and system attributes. The Other Attributes dialog box that you can invoke from the Edit Panel dialog box now has controls for the following items:

- Scale Contents on Resize
- Minimum Height for Rescaling
- Minimum Width for Rescaling
- Resolution Adjustment

The Floating Window option on the Other Attributes dialog box is renamed to Floating Style. The Floating Style ring control contains the following choices:

- Never
- When App is Active
- Always

All controls in the Color Preferences section of the Preferences dialog box, except for the Default Editor Background Color, are now in a new section called Preferences for New Panels. The Preferences for New Panels section also includes a new Resolution Adjustment control.

A new Preferences for New Controls section specifies the default control and label text styles for a new control.

A **Default** command button in the Color Preferences section allows you to return to the original editor background color. On Windows, this is your system background color.

Changes to Existing Functions

For `GetPrintAttribute` and `SetPrintAttribute`, the last parameter is the attribute value. In previous versions of LabWindows/CVI, this is an integer. Now the parameter is a variable type argument. This change does not require any modifications to your source code.

The attribute `ATTR_FLOATING` has the following new constants:

```
0      VAL_FLOAT_NEVER
1      VAL_FLOAT_APP_ACTIVE
-50    VAL_FLOAT_ALWAYS
```

The constant `VAL_FLOAT_APP_ACTIVE` specifies to make the panel floating, or *topmost*, only when the application is active. The constant `VAL_FLOAT_ALWAYS` maintains the panel as floating or topmost even when the application is not active.

When LabWindows/CVI displays a popup panel, such as when you call `FileSelectPopup` or `InstallPopup`, all LabWindows/CVI panels with the `ATTR_FLOATING` attribute set to either `VAL_FLOAT_APP_ACTIVE` or `VAL_FLOAT_ALWAYS` do not float while the popup is displayed. In previous versions of LabWindows/CVI, a floating window can cover the popup window, preventing an interaction with the popup window.

`LoadPanel`, `LoadPanelEx`, `LoadMenuBar`, and `LoadMenuBarEx` now work on `.tui` files and on `.uir` files. Whereas `.uir` files are in binary format and load quickly, `.tui` files are in text format and load slowly. You can save a `.tui` file by using the **Save in Text Format** command in the **Options** menu of the User Interface Editor. Because text format files load slowly, National Instruments recommends that you continue to use `.uir` files. The ability to load `.tui` files makes it possible for user-written wizards to generate user interface files that you can load programmatically.

Details on Loading Panels and Menubars from .tui Files

When you call `LoadPanel` or `LoadPanelEx` on a `.tui` file, the panel resource ID parameter must be the header number of the `.tui` file section in which the panel is defined. For example, if the section header for the desired panel is `[Panel003]`, pass 3 as the panel resource ID.

`LoadPanel` or `LoadPanelEx` loads all the controls in the `.tui` file with section headers in the form `[PanelNNN_ControlYYY]`, where `NNN` is the panel resource ID and `YYY` is 001 or greater. The control numbers must start at 001 and be consecutive. To pass a control ID to other User Interface Library functions, pass `YYY + 1`. For instance, if the section header is `[Panel003_Control001]` for a control on which you want to set an attribute value, pass 2 as the control ID parameter to `SetCtrlAttribute`.

When you call `LoadMenuBar` or `LoadMenuBarEx` on a `.tui` file, the menubar ID parameter must be the header number of the `.tui` file section in which the panel is defined. For example, if the section header for the desired menubar is `[MenuBar003]`, pass 3 as the menubar ID.

`LoadMenuBar` or `LoadMenuBarEx` loads all the menus and menu items in the `.tui` file with section headers in the form `[MenuBarNNN_ . . .]`, where `NNN` is the menubar ID passed to

the function. The menu ID or menu item ID that you pass to User Interface Library functions is based on a depth-first traversal of all the items in the menu tree, starting at 2. For submenu items, the submenu itself has an ID that is one greater than the item ID of submenu entry in the parent menu.

If you save a `.tui` file in the User Interface Editor in LabWindows/CVI 5.0 or higher and you have an up-to-date include (`.h`) file the User Interface Editor generates, you can use the `panel`, `control`, `menubar`, `menu`, `submenu`, and `menu item` constants in the include file as parameters to User Interface Library functions.

Warning of Change to Text Format (.tui) Files

The order in which `panel` and `menubar` sections are written has changed to allow you to use user interface include file constants in conjunction with `.tui` files. In addition, the version number has changed from 101 to 102.

If you use `.tui` files to find differences between versions of your `.uir` files and your generated `.tui` files in previous version of LabWindows/CVI, use LabWindows/CVI 5.0 to create new baseline `.tui` files for all your `.uir` files.

New Functions

The following nine new functions in the User Interface Library are listed in alphabetical order:

- `GetScaledCtrlDisplayBitmap` creates a bitmap object that contains a snapshot image of the current appearance of the specified control.
- `GetScaledPanelDisplayBitmap` creates a bitmap object that contains a snapshot image of the current appearance of the specified panel.
- `GetTextBoxLineIndexFromOffset` returns the zero-based index of the line on which the character at a specified byte offset is contained in a textbox control.
- `GetTextBoxLineOffset` returns the zero-based index of the line on which the character at a specified byte offset is contained in a textbox control.
- `MakeApplicationActive` activates your application and brings its topmost panel to the front.
- `MinimizeAllWindows` hides all panels created in the current thread, other than panels with their own taskbar buttons. You can restore the panels by clicking on the taskbar button for the thread.
- `PostDeferredCallToThread` has the same capabilities as `PostDeferredCall` except that you can specify the thread in which the callback function is to be called.
- `SetBitmapData` changes the image contents of an existing bitmap.
- `SetPanelSize` sets the height and width of the panel.

New Error Codes

Table 3 lists the new User Interface Library error codes.

Table 3. New User Interface Library Error Codes

Code	Error Message
-129	The specified operation can be performed only in the thread in which the top-level panel was created.
-130	The specified panel was not found in the .tui file.
-131	The specified menubar was not found in the .tui file.
-132	The specified control style was not found in the .tui file.
-133	A tag or value is missing in the .tui file.

Using the User Interface Library in a Multithreaded Executable under Windows 95/NT

The User Interface Library is now multithread safe when used on Windows 95/NT in a standalone executable or in a DLL called from a standalone executable. For more information on ways you can use the User Interface Library in a multithreaded program and various behaviors, rules, and restrictions, refer to the *Multithreading in a Windows 95/NT Executable* section in Chapter 3, *Programming with the User Interface Library*, in the *LabWindows/CVI User Interface Reference Manual*.

Mouse Wheel Support

The LabWindows/CVI User Interface panels now support mouse pointing devices with wheels, such as the Microsoft IntelliPoint Mouse. The mouse wheel allows you to scroll up or down in any panel, listbox control, or textbox control that contains a vertical scrollbar.

Changes to the Programmer Reference Manual

This section contains several additions to the *LabWindows/CVI Programmer Reference Manual*.

Stack Size

The maximum stack size on Windows 3.1 has increased to 40 KB.

After you install the LabWindows/CVI development environment, the default stack size for program execution increases to 40 KB on Windows 3.1 and 250 KB on all other platforms.

Details of User Protection

The *Avoid Unassigned Dynamic Allocation in Function Parameters* section is new to the *Details of User Protection* discussion in Chapter 1, *LabWindows/CVI Compiler*, of the *LabWindows/CVI Programmer Reference Manual*.

Linking Objects and Static Libraries in External Compilers

When you use an external compiler to link a project that contains object or static library files created in LabWindows/CVI, there are several points to remember. Refer to the *Using Object and Library Files in External Compilers* section in Chapter 3, *Windows 95/NT Compiler/Linker Issues*, of the *LabWindows/CVI Programmer Reference Manual* for more information.

Use of DllMain: Clarification

Each DLL can have a `DllMain` function, except that the Borland compiler uses `DllEntryPoint` as the name. The operating system calls `DllMain` with various messages. To generate the template for `DllMain`, use the **Insert Constructs** command in the **Edit** menu of the Source window.

Use caution when inserting code in the `PROCESS_ATTACH` and `PROCESS_DETACH` cases. In particular, avoid calling into other DLLs in these two cases. The order in which Windows 95/NT initializes DLLs at startup and unloads them at process termination is not well defined. Thus, the DLLs you want to call might not be in memory when your `DllMain` receives the `PROCESS_ATTACH` or `PROCESS_DETACH` message.

It is always safe to call into the LabWindows/CVI Run-time Engine in a run state change callback as long as you do so before calling `CloseCVRTE`.

Releasing Resources when a DLL Unloads: Clarification

When a program terminates, the operating system releases resources your DLL allocates. If your DLL remains loaded throughout program execution, it does not need to release resources explicitly when the system unloads it at program termination. However, if the program unloads your DLL during program execution, it is a good idea to have your DLL release any resources it allocates. The DLL can release resources in `DllMain` in response to the `PROCESS_DETACH` message. Alternatively, the DLL can release resources in a function that it registers with the ANSI C `atexit` function. The system calls the function you register when the DLL receives the `PROCESS_DETACH` message.

If your DLL calls into the LabWindows/CVI Run-time Engine DLL, it can allocate resources, such as user interface panels. If a program unloads your DLL during execution, you might want to release these resources by calling functions such as `DiscardPanel` in the LabWindows/CVI Run-time Engine. On the other hand, as explained in the previous section, it is generally unsafe to call into other DLLs in response to the `PROCESS_DETACH` message.

To solve this dilemma, you can use `CVIRTEHasBeenDetached` in the Utility Library. It is always safe to call `CVIRTEHasBeenDetached`. `CVIRTEHasBeenDetached` returns `FALSE` until the main Run-time Engine DLL, `cvirte.dll`, receives the `PROCESS_DETACH` message. Consequently, if `CVIRTEHasBeenDetached` returns `FALSE`, your DLL can safely call functions in the LabWindows/CVI Run-time Engine to release resources.



Note *The Run-time Engine DLL contains the ANSI C, DDE, Formatting and I/O, RS-232, TCP, User Interface, and Utility libraries.*

Use of Run State Change Callbacks: Clarification

You can include run state change callbacks in DLLs you build in LabWindows/CVI. When running a program in LabWindows/CVI, a run state change callback receives notification when the program starts, suspends, resumes, and stops. If you include a run state change callback in a DLL, you must take special care. Refer to the *Notification of Changes in Run State* section in Chapter 2, *Using Loadable Compiled Modules*, in the *Programmer Reference Manual* for a detailed discussion of run state change callbacks.

Changes to the ANSI C Library

This section contains information on changes to the ANSI C Library and corrections to the documentation.

Time and Date Functions

The time and date functions of the ANSI C Library include several changes.

Time Zone Bugs Fixed on Windows 95/NT

In the previous version of LabWindows/CVI, functions such as `localtime` that require time zone information operate incorrectly in some cases on Windows 95/NT.

The LabWindows/CVI ANSI C Library incorrectly interprets the Windows time zone information in time zones east of Greenwich Mean Time. This problem occurs only if the `TZ` environment variable is not available. LabWindows/CVI 5.0 corrects this problem.

The library incorrectly determined that daylight savings time was in effect in areas that do not observe daylight savings time. The library now honors the Windows time zone information when it indicates that daylight savings time is not observed. For example, there is an Arizona time zone shown in the Time Zone tab of the Windows Date/Time Properties dialog box. The system information for the Arizona time zone indicates that daylight savings time is not observed.

Modifying the DST Rules String: Clarification

The LabWindows/CVI ANSI C Library uses the DST rules string to determine the period of each year in which daylight savings time is in effect. The *Time and Date Functions* section of Chapter 1, *ANSI C Library*, of the *LabWindows/CVI Standard Libraries Reference Manual* contains an improved discussion of the DST rules string and how you can modify the string.

Changes to the RS-232 Library

This section contains information on changes to the RS-232 Library.

More COM Ports Allowed

The maximum valid value for the **COMPort** parameter to RS-232 Library functions increases from 32 to 1,000.

New Error Code

Table 4 shows the new RS-232 Library error code.

Table 4. New RS-232 Library Error Code

Code	Error Message
-1	Unable to allocate system resources

Unknown System Error on Windows 95/NT

If you pass `GetRS232ErrorString` an error code of -1 (Unknown System Error) on Windows 95/NT, the function calls the Windows SDK `GetLastError` function and translates the return value into a Windows message string.

Input Queue Size: Clarification

If you pass an odd number for **inputQueueSize** on Windows NT when calling `OpenComConfig`, LabWindows/CVI rounds it to the next highest even number. The Microsoft serial driver for Windows NT requires an even number for the input queue size.

On all Windows platforms, LabWindows/CVI passes **inputQueueSize** to the Windows serial driver, which might use a different number. For example, the Windows NT serial driver imposes a minimum input queue size of 4,096.

Multithreading and RS-232 Error Information

The `rs232err` global variable is *not* multithread safe. It reflects the error value (zero if successful) of the last RS-232 function call in the application, regardless of thread.

The `ReturnRS232Err` function *is* multithread safe. It returns the error value (zero if successful) from the most recent RS-232 activity in the same thread.

Because `ComWrt` can return before all bytes in the output queue have been written to the port, a write error can occur after `ComWrt` returns successfully. If `ReturnRS232Err` is then called, it returns a value that reflects the write error. The `rs232err` global variable does not reflect the write error.

For these reasons, National Instruments recommends that you always use `ReturnRS232Err` instead of the `rs232err` global variable.

If you want to know the error associated with a particular function call, save the return value from the function call in a variable.

Multithreading Limitations

Do not use `XModemReceive` or `ComToFile` in two threads at the same time if the target file in both calls is the Standard Output.

Changes to the DDE Library

This section contains information on changes to the DDE Library and corrections to the documentation.

Corrections

In the previous version of the manual, the order of **topicName** and **itemName** parameters in the `BroadcastDDEDataReady` function prototype is incorrect. The **topicName** is the second parameter, and the **itemName** is the third parameter.

Obsolete Error Codes

Table 5 lists obsolete DDE Library error codes that are removed from `ddesupp.h`.

Table 5. Obsolete DDE Library Error Codes

Obsolete Code	Defined Constant
-6	<code>-kDDE_ReadFailed</code>
-7	<code>-kDDE_WriteFailed</code>
-8	<code>-kDDE_ExecutionFailed</code>
-11	<code>-kDDE_TimeOutErr</code>
-13	<code>-kDDE_FailedToSetUpHotLink</code>
-14	<code>-kDDE_FailedToSetUpWarmLink</code>

Table 5. Obsolete DDE Library Error Codes (Continued)

Obsolete Code	Defined Constant
-15	-kDDE_GeneralIOErr
-29	-kDDE_Reentrancy

New Error Codes

Table 6 lists new DDE Library error codes.

Table 6. New DDE Library Error Codes

New Code	Defined Constant
-13	-kDDE_NotThreadOfServer
-14	-kDDE_NotThreadOfClient

Multithreading

The DDE Library is now multithread safe when used on Windows 95/NT in a standalone executable or in a DLL called from a standalone executable. A few restrictions exist, however, that you must observe. These restrictions stem from limitations of the Windows DDE:

- After you call `RegisterDDEServer` to register your program as a server, you must make all subsequent function calls that apply to the server in the same thread in which you called `RegisterDDEServer`.
- After you call `ConnectToDDEServer` to create a client connection, you must make all subsequent functions calls that apply to the connection in the same thread in which you called `ConnectToDDEServer`.

Changes to the TCP Library

This section contains information on enhancements to the TCP Library.

Multithreading

The TCP Library is now multithread safe when used on Windows 95/NT in a standalone executable or in a DLL called from a standalone executable.

New TCP Library Functions

The following seven new functions in the TCP Library are listed in alphabetical order:

- `GetHostTCPSocketHandle` obtains the system socket handle that corresponds to a TCP Library connection.
- `GetTCPHostAddr` obtains the IP address of the computer on which your program is running.

- `GetTCPHostName` obtains the name of the computer on which your program is running.
- `GetTCPPeerAddr` obtains the IP address of the computer on which a remote client or server is running.
- `GetTCPPeerName` obtains the name of the computer on which a remote client or server is running.
- `GetTCPSystemErrorString` obtains a system message that describes the error that caused a TCP Library function to fail.
- `SetTCPDisconnectMode` sets the method used to close the local conversation handle when a remote client or server terminates a connection.

Changes to Existing TCP Library Functions

LabWindows/CVI 5.0 now enforces the timeout parameter for `ServerTCPRead` and `ClientTCPRead`. The functions now wait for the specified interval when they receive less than the maximum number of data bytes to be read. In previous versions of LabWindows/CVI, when the functions receive data, they return without waiting for the timeout interval. This change might require modifications to your source code.

Changes to the Utility Library

This section contains information on two new functions in the Utility Library and corrections and clarifications to the documentation.

Multithreading

The Utility Library is now multithread safe when used on Windows 95/NT in a standalone executable or in a DLL called from a standalone executable. No restrictions exist.

Corrections and Clarifications to the Documentation

`GetCurrentPlatform` returns `kPlatformWin16` when called from a program that is running on Windows 95 but that was built using LabWindows/CVI for Windows 3.1.

If you configure Windows 95 to hide the taskbar, calling `DisableTaskSwitching` prevents the user from using the mouse to bring the taskbar back up.

The documentation for `DisableTaskSwitching` contains a registry key name that you can use on Windows NT to arrange for your application to be brought up in place of the Windows NT Task Manager. The registry key name in the previous version of the manual is incorrect. The correct name is `HKEY_LOCAL_MACHINE\Software\Microsoft\Windows NT\CurrentVersion\Winlogon`.

When you call `GetExternalModuleAddr` to obtain the address of a function, you normally assign the return value to a function pointer. If the function has a calling convention that differs from the default calling convention, you must include the calling convention in the

declaration of the function pointer. For example, if you declare the function in the external module as

```
int __stdcall SetADouble (double d);
```

and the default calling convention is `__cdecl`, declare the function pointer as

```
int (__stdcall * SetADouble_FnPtr)(double d) = NULL;
```

Use the **Compiler Options** command in the **Options** menu of the Project window to determine the default calling convention.

If you launch a 16-bit executable on Windows NT, `ExecutableHasTerminated` cannot determine whether the executable process has terminated. The value `ExecutableHasTerminated` returns is always 1. In addition, `TerminateExecutable` cannot attempt to terminate the launched executable process.

New Utility Library Functions

LabWindows/CVI 5.0 adds three new functions to the Utility Library.

`MapPhysicalMemory` maps a physical address to a pointer that can be used in your program like any other C pointer. For example, you can read or write an area of physical memory by incrementing the pointer after each access.

`UnMapPhysicalMemory` unmaps an address that was mapped using `MapPhysicalMemory`.

`CVIRTEHasBeenDetached` indicates whether Windows 95/NT has detached the LabWindows/CVI Run-time Engine from your standalone executable process.

Changes and Clarifications to Existing Utility Library Functions

For `Delay` and `SyncWait` on Windows 95/NT and UNIX, the respective delay and interval parameters might now suspend the execution of the current thread while waiting for the specified interval to expire. In previous versions of LabWindows/CVI, the functions wait without releasing control to other threads, unnecessarily using CPU cycles. This change should not require any modifications to your source code.

For Windows 95/NT, `CheckForDuplicateAppInstance` determines if another copy of the same executable is running. This function knows if another copy of the executable is running only if:

- The other copy has already called this function.
- The other copy of the executable was the only one running when that copy of the executable called this function.
- The other copy of the executable has the same path as the current executable.

In previous versions of LabWindows/CVI, the `Timer` function returns an invalid result if your program runs for more than 49.71 days. At some point between 49.71 days and 99.42 days after your first call to `Timer`, the function returns a value 4,294,967.297 seconds less than it

should be. Thereafter, the value loses another 4,292,967.296 seconds for each 49.71-day period that passes. LabWindows/CVI, version 5.0 corrects this invalid result.

Changes to the Easy I/O for DAQ Library

The Analog Input functions that have high limit and low limit parameters are modified to allow you to make use of the default limits set in the DAQ Channel Wizard or the NI-DAQ Configuration Utility. These functions are `AIAcquireWaveforms`, `AISampleChannel`, `AISampleChannels`, and `AISartAcquisition`.

If you set both **highLimit** and **lowLimit** to 0.0, these functions use the default limits, which are defined as follows:

- For channels configured in the DAQ Channel Wizard, the default limits are set in the Physical Quantity section of the DAQ Channel Wizard.
- For hardware channels, the default limits are set in the AI section of the NI-DAQ Configuration Utility.

New ActiveX Automation Library

The ActiveX Automation Library contains functions that control ActiveX Automation servers. Use the ActiveX Automation Library in conjunction with the instrument drivers the ActiveX Automation Controller Wizard generates. You can invoke this wizard with the **Create ActiveX Automation Controller** command in the **Tools** menu.



Note *This library is available only on Windows 95/NT.*

Active X Automation Library Function Overview

ActiveX Automation (formerly called OLE Automation) allows applications to make their unique features available to scripting tools and other applications. An ActiveX Automation server is the application that exposes its features. An ActiveX Automation controller is the application that uses the features of an ActiveX Automation server. An ActiveX Automation server exports its features as a set of ActiveX Objects. For example, Microsoft Excel exposes its workbooks, worksheets, and charts as ActiveX Objects. Each ActiveX Object provides methods and properties that other applications can access. For example, the Microsoft Excel worksheet object provides a `calculate` method that calculates the values in a worksheet.

The ActiveX Automation Library contains functions that facilitate calling into ActiveX server interfaces. Use the ActiveX Automation Library in conjunction with the instrument drivers the ActiveX Automation Controller Wizard generates. The ActiveX Automation Controller Instrument Drivers contain C functions to create ActiveX Objects, to call ActiveX Object methods, and to get and set ActiveX Object properties. Select **Tools»Create ActiveX Automation Controller** to start the wizard.

The ActiveX Automation Library contains functions that do the following:

- Help you work with the `VARIANT` parameters, `SAFEARRAY` parameters, and return values of the functions in the generated instrument drivers
- Free resources dynamically allocated by the generated instrument drivers or by other ActiveX Automation Library functions
- Display error information the library functions or the Automation server methods return

The ActiveX Automation Library also contains low-level functions that the generated drivers use. These low-level functions invoke methods of server objects and get and set properties of server objects.

If you want to use the low-level functions, you should know ActiveX concepts. In particular, you should know how to browse through an ActiveX Automation server type library.

Using ActiveX Automation Object Handles from Multiple Threads on Windows 95

On Windows 95, without DCOM for Windows 95, you can use an ActiveX Automation object handle only in the thread that created it. This limitation does not exist if you install DCOM for Windows 95. You can find DCOM for Windows 95 in the DCOM directory on your LabWindows/CVI CD. You also can download DCOM for Windows 95 from Microsoft's Web or FTP site.

Additions to the ActiveX Automation Library Function Reference

For the functions `CA_VariantDispatch`, `CA_VariantIUnknown`, `CA_VariantBSTR`, `CA_VariantSetDispatch`, `CA_VariantSetIUnknown`, `CA_VariantSetBSTR`, and `CA_VariantSetSafeArray`, add the following text to the function parameter discussion:



Note *The value stored in the `VARIANT` parameter is a reference to the original value. Calling `CA_VariantClear` frees the original value.*

For the functions `CA_VariantSet1DArray` and `CA_VariantSet2DArray`, add the following text to the function parameter discussion:



Note *Use `CA_VariantClear` to free the safe array stored in the `VARIANT`. Refer to `CA_VariantClear` for more information.*

For the function `CA_VariantSetCString`, add the following text to the function parameter discussion:



Note *Use `CA_VariantClear` to free the `BSTR` stored in the `VARIANT`. Refer to `CA_VariantClear` for more information.*

For the functions `CA_VariantGetSafeArray`, `CA_Array1DToSafeArray`, and `CA_Array2DToSafeArray`, add the following text to the function parameter discussion:

Use `CA_SafeArrayDestroy` to free the returned safe array.

For the function `CA_VariantClear`, update the text to the function parameter discussion with the following:

Although this function can be called on a `VARIANT` that contains a value of any type, it frees resources only when the variant contains a string (`BSTR`), an automation object interface (`LPDISPATCH`), an unknown interface (`LPUNKNOWN`), or a safe array (`SAFEARRAY`).

For the function `CA_VariantGetObjHandle`, add the following text to the function parameter discussion:

Use `CA_DiscardObjHandle` to free the returned `CAObjHandle`.

For the functions `CA_VariantGet1DArray` and `CA_VariantGet2DArray`, add the following text to the function parameter discussion:

Use `CA_FreeMemory` to free the returned array.

New IVI Library

The IVI (Intelligent Virtual Instruments) Library gives developers a structured framework for creating *VXIplug&play* instrument drivers with advanced features such as state caching, simulation, and production and development modes. The library is supplemented by the IVI wizard, which automatically creates the skeleton of an IVI driver for you, including source code and function panels. The *LabWindows/CVI Instrument Driver Developers Guide* contains the IVI Library function reference and instructions on how to create IVI drivers.

New Advanced Analysis Library Functions

LabWindows/CVI 5.0 adds 40 new functions to the Advanced Analysis Library.

Function Tree Layout for New Functions

The following shows the new functions under their function tree classes.

Class/Panel Name	Function Name
Vector & Matrix Algebra	
Real Matrices	
Create Special Matrix	SpecialMatrix
Determinant (General)	GenDeterminant
Invert Matrix (General)	GenInvMatrix
Solution of Linear Eqs (General)	GenLinEqs
Outer Product	OuterProduct
Rank	MatrixRank
Norm	MatrixNorm
Condition Number	ConditionNumber
Eigenvalues & Eigenvectors (Symmetric)	SymEigenValueVector
Eigenvalues & Eigenvectors (General)	GenEigenValueVector
Singular Values of a Matrix	SVDS
SVD Factorization	SVD
QR Factorization	QR
Cholesky Factorization	Cholesky
PseudoInverse Matrix	PseudoInverse
Test Positive Definiteness	CheckPosDef
Create Special Complex Matrix	CxSpecialMatrix
Complex Dot Product	CxDotProduct
Complex Transpose	CxTranspose
Complex Determinant	CxDeterminant
Complex PseudoInverse Matrix	CxPseudoInverse
Complex Trace	CxTrace
Complex Invert Matrix	CxGenInvMatrix
Solution of Complex Linear Eqs	CxGenLinEqs
Complex Multiply Matrices	CxMatrixMul
Complex Outer Product	CxOuterProduct
Complex Rank	CxMatrixRank
Complex Norm	CxMatrixNorm
Complex Condition Number	CxConditionNumber
Complex Eigenvalues & Eigenvectors	CxEigenValueVector
Complex Singular Values	CxSVDS
Complex SVD Factorization	CxSVD
Complex QR Factorization	CxQR
Complex Cholesky Factorization	CxCholesky
Complex Test Positive Definite	CxCheckPosDef
Complex LU Factorization	CxLU
Additional Numerical Methods	
Complex Polynomial Roots	CxPolyRoots
Numeric Integration	NumericIntegration
Peak Detector	PeakDetector
Free Analysis Memory	FreeAnalysisMem

General Information

Using LabWindows/CVI Utility Library in the Borland Compiler

When you use the LabWindows/CVI libraries with the Borland compiler, the `utility.h` header file in the Borland `include` subdirectory might be referenced incorrectly instead of the LabWindows/CVI `utility.h` header file. You can control the search order for the header files through one of the following methods:

- Place the LabWindows/CVI `include` directory before the Borland `include` directory in the Borland Project Options directory search paths.
- In your source code, refer to the explicit path to the header file, for example, `#include "c:\cvi\include\utility.h"`.
- Rename the Borland `utility.h` file.

Using NetDDE on Windows

Refer to the LabWindows/CVI `readme.cvi` file for information on using NetDDE on Windows 3.1, Windows 95, and Windows NT.

Special Instructions to LabWindows/CVI 5.0 Beta Testers

A debuggable DLL built with LabWindows/CVI 5.0 Beta 1 is not compatible with the final release of LabWindows/CVI 5.0. You must rebuild the DLL before you try to debug the DLL inside the LabWindows/CVI development environment.

No Support for Multiple Monitor Systems

LabWindows/CVI 5.0 does not support systems with multiple monitors, including Windows 98, Windows NT 5.0, and third-party solutions for Windows 95/NT 4.0.

Dynamically Loading DLL Created in Third-Party Compiler Might Lose Handles

If a DLL created in a third-party compiler/linker is dynamically loaded and unloaded from a process and if that DLL uses the hardware static libraries located in the LabWindows/CVI `\extlib` subdirectory, the process loses Windows handles. The external compiler support libraries that exhibit this behavior are `dataacq.lib`, `easyio.lib`, `gpib.lib`, `nivxi.lib`, and `visa.lib`. The loss of Windows handles occurs when the hardware static libraries of the calling DLL do not release the internal handles used to load the hardware libraries. A workaround is to use the import libraries that come with the DAQ, GPIB, VXI, and VISA software instead of using the static libraries from the LabWindows `\extlib` directory. A drawback to this solution is that some additional functions unique to the LabWindows/CVI versions of these libraries are not available.



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